

Chapter 6. Project Alternatives

This MSFMP establishes a fisheries management program for market squid and procedures by which the Commission will manage the market squid resource and the various fishery components.

Management measures implementing the MSFMP, which directly control fishing activities, are consistent with the goals and objectives of the MSFMP, MLMA, and other applicable laws. These management actions will be reviewed regularly by the Department in conjunction with a market squid advisory committee that will provide a written report to the Commission with their recommendations for changes to the Project, if deemed necessary. Provisions are included that will allow the Commission to act in a more timely manner under certain conditions.

The goals and objectives of the MSFMP are to:

- 1) Protect the market squid resource by minimizing the risk of overfishing;
- 2) Minimize adverse socio-economic impacts on the fishing communities whenever possible;
- 3) Minimize other ecological impacts that result from the commercial squid fishery.

6.1 Market Squid Resource Protection Issues

6.1.1 Problem Statement

Squid fishery resources throughout the world have been successfully managed by allowing a proportion of the population to escape in order to sustain the population for the following year. These escapement models require an accurate assessment of the population biomass, squid mortality, and a measure of fishing pressure. Population modeling work has not been successful in estimating the biomass of market squid. Certain life history characteristics (e.g., short lifespan, unknown migration) of market squid do not make it an ideal candidate for standard fishery population models. Market squid are important as forage to a long list of fish, birds, and mammals including threatened, endangered, and depleted species (section 2-7, Morejohn et al. 1978). Some of the more important squid predators are king salmon, Coho salmon, lingcod, rockfish, Pacific bonito, halibut, tuna, harbor seals, California sea lions, sea otters, elephant seals, Dall's porpoises, shearwaters, cormorants, storm-petrels and common murre. It is not currently possible to estimate the total amount of market squid used as forage by all marine mammals in the California Current

ecosystem or the size of the market squid population necessary to sustain predator populations. To minimize the chances of overfishing, the Department recommendations for market squid resource protection take into account the uncertainties surrounding the market squid biomass and population. The Department's proposed management measures include: (1) seasonal statewide catch limitations, (2) daily trip limits, (3) weekend closures, and (4) continuation of the Department's research and monitoring program.

6.1.2 Catch Limitations

6.1.2.1 Seasonal Statewide Catch Limitation

Background

The market squid fishing season is 1 April through 31 March and a maximum seasonal landings limit does not allow the commercial catch to expand beyond a maximum volume. A landings limit may provide some stock protection, however, it probably does not provide protection when squid are less abundant and the limit is not reached. Although there is little information to indicate whether the squid fishery is or is not sustainable at the high catch levels experienced since the mid-1990's, as a precautionary measure, it is prudent not to allow landings to expand beyond present levels without better methods to assess the status of the resource. Given the number of currently permitted squid vessels and underutilized capacity in the fleet, dramatic increases in catch could occur in a short time frame unless a safeguard is in place. In October 2001, the Commission established a seasonal harvest limit of 125,000 short tons. The limit was based on the highest recorded seasonal catch level for the fishery (1999-2000)(Table 6-1). The catch limitation serves to prevent volumetric growth of the fishery should market demand encourage such expansion.

Restrepo et al. (1998) provide technical guidance for establishing catch limits in data-poor fisheries. In data-poor cases, they recommend that the default catch limit be implemented by multiplying the average catch from a time period when there is no quantitative or qualitative evidence of declining abundance ("Recent Catch") by a factor depending on a qualitative estimate of relative stock size:

Above Bmsy:	Limit Catch = 1.00 * (Recent Catch)
Above MSST, Below Bmsy:	Limit Catch = 0.67 * (Recent Catch)
Below MSST (i.e., overfished):	Limit Catch = 0.33 * (Recent Catch)

where Bmsy is the long-term average biomass that would be achieved if fishing at a constant fishing mortality rate equal to Fmsy, MSST is the Minimum Stock Size Threshold (or 1/2 Bmsy), and Fmsy is the fishing mortality rate which would result in MSY. In data-poor cases where stock status relative to Bmsy cannot be determined analytically, an approach based on "informed judgment" may be necessary.

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A number of time periods may be considered in calculating the recent average catch of market squid (Table 6-2). With the exception of El Niño years, when availability is assumed to be low, squid landings have been increasing since 1991. The average catch for the last ten seasons does not exhibit any evidence of declining abundance (Table 6-2). The short lifespan (approximately six months) of market squid supports a shorter historical catch period for computing catch history; the three-year historical period would encompass between three and six generations. This shorter historical average period more accurately reflects current demand and fishing effort.

Table 6-1. Historical market squid landings (short tons).	
Season	Total Landings
1988-1989	48,195
1989-1990	33,051
1990-1991	32,472
1991-1992	38,666
1992-1993 – El Niño	18,793
1993-1994	54,452
1994-1995	63,592
1995-1996	93,833
1996-1997	124,309
1997-1998 – El Niño	10,898
1998-1999 – El Niño	11,699
1999-2000	126,772
2000-2001	123,400

Table 6-2. Landing limits based on default limit control rule*.				
Average Catch** (tons)		Above B_{MSY}	Above MSST/Below B_{MSY}	Below MSST
10 years	73,874	73,874	49,496	24,378
5 years	106,381	106,381	71,275	35,106
3 years	124,087	124,087	83,138	40,949

* B_{MSY} = average spawning biomass; MSST = minimum stock size threshold.

**averages based on most recent years, excluding El Niño years.

A. Options for Establishing a Seasonal Statewide Catch Limitation

Option A.1: Establish a seasonal catch limitation of 83,138 short tons. This seasonal catch limitation is based on the seasonal catch limitation on the three-year recent average catch (Table 6-2) and the assumption that the stock is below B_{MSY} and above MSST. This risk-neutral approach uses a multiplier of 0.67. Under Option A.1, a maximum seasonal catch limitation of 83,138 would be implemented.

Option A.2 (Proposed action – status quo): Establish a seasonal catch limitation of 125,000 short tons. This seasonal catch limitation is based on the three-year

recent average catch (Table 6-2) and the assumption that the stock is above B_{MSY} . This approach uses a multiplier of 1.0. Under Option A.2, a maximum seasonal catch limitation of 124,087 would be implemented (approximately 125,000 short tons as currently implemented in interim regulations).

Option A.3: Do not set a seasonal catch limitation. The SFAC did not support any landings limit. Most fishermen and processors opposed the landings limit. There was speculation that the likelihood of repeating a catch of 125,000 tons in a season is unlikely given the implementation of weekend closures. Landings for the 2000-2001 season were 123,400, which was 98.7% of the limit.

Option A.4: Establish a seasonal catch limitation based on environmental conditions as recommended by the SRSC: a seasonal harvest of 115,000 short tons in a non-El Niño period and a landings cap of 11,000 short tons during an El Niño period.

6.1.2.2 Daily Trip Limit for Market Squid Vessels and Brail Vessels

Background

The purpose for implementing daily trip limits for market squid vessels and brail vessels is a tool to prevent change in the general size composition of individual vessels once permits become transferable. Further, a trip limit for market squid vessels should serve to protect the resource through distribution of harvest throughout the season, which may be of extreme importance since the fishery targets spawning squid. Establishing daily trip limits for squid fishing vessels would prevent current vessels from increasing catch volume on a per-trip basis when market-imposed trip limits are lifted or technological developments allow for increased efficiency. A trip is defined as any activity (e.g., catching, landing, transporting, or delivering) by a vessel that harvests squid with a squid permit (i.e., a possession limit that applies to harvesting operations only). From 1 January 1990 through 12 November 1999, 95.6% of all currently permitted vessels landed 60 tons or less on each trip (Fig. 6-1). For the same time period, 99.7% of vessels landed 90 tons or less daily. Additionally, only 2.3% of all squid landings on record (1981 through 2001) are in excess of 60 tons per trip.

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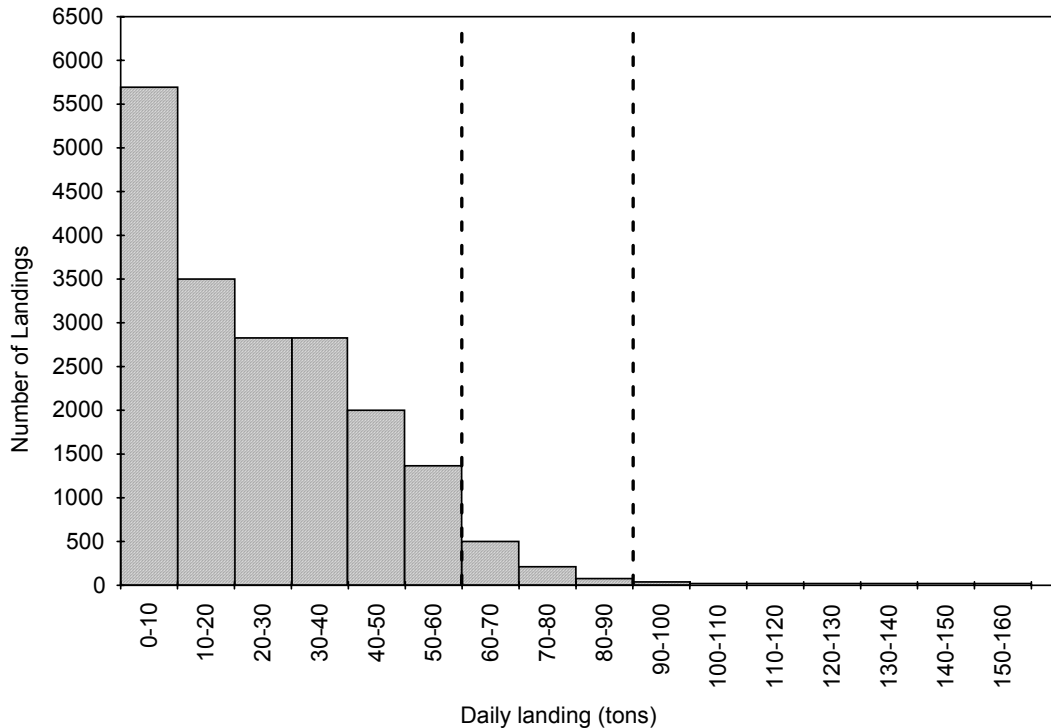


Figure 6-1. Daily market squid landings for currently permitted vessels from January 1, 1990 through November 12, 1999.

Although there are vessels in the current fleet capable of delivering loads well in excess of 60 tons, there is rarely the opportunity to deliver a vessel's full capacity tons because market-imposed trip limits of 30 tons are routine. Processors set the limit at 30 tons because this is limited by their processing and freezing capacity. The CPS FMP federal guidelines limit CPS finfish harvest to a 125-metric ton (approximately 137.7 short tons) daily trip limit, but the majority of the vessels are well under this volume. Therefore, applying CPS consistency standard would be inappropriate and not go far enough toward reducing existing excessive capacity. It is believed that consistency with the CPS FMP on this issue will not accomplish the objective of market squid resource protection, and a more restrictive level is needed and allowable under federal guidelines.

Most brail vessels in the squid fleet have a hold capacity typically 15 tons or less and a separate trip limit based on historical catch information needs to be designated for these vessels. Establishing a trip limit for vessels issued a brail permit will prevent current brail vessels from increasing catch volume on a per-trip basis. Landings data indicate less than five percent of landings in excess of 15 tons have been made since 1990 using brail gear with a maximum brail landing of 38 tons (fig. 6-2). In view of the fact that this sector of the commercial squid fleet is small, it is not the intent for vessels with brail permits to improve their harvesting capability using improved technology or other means.

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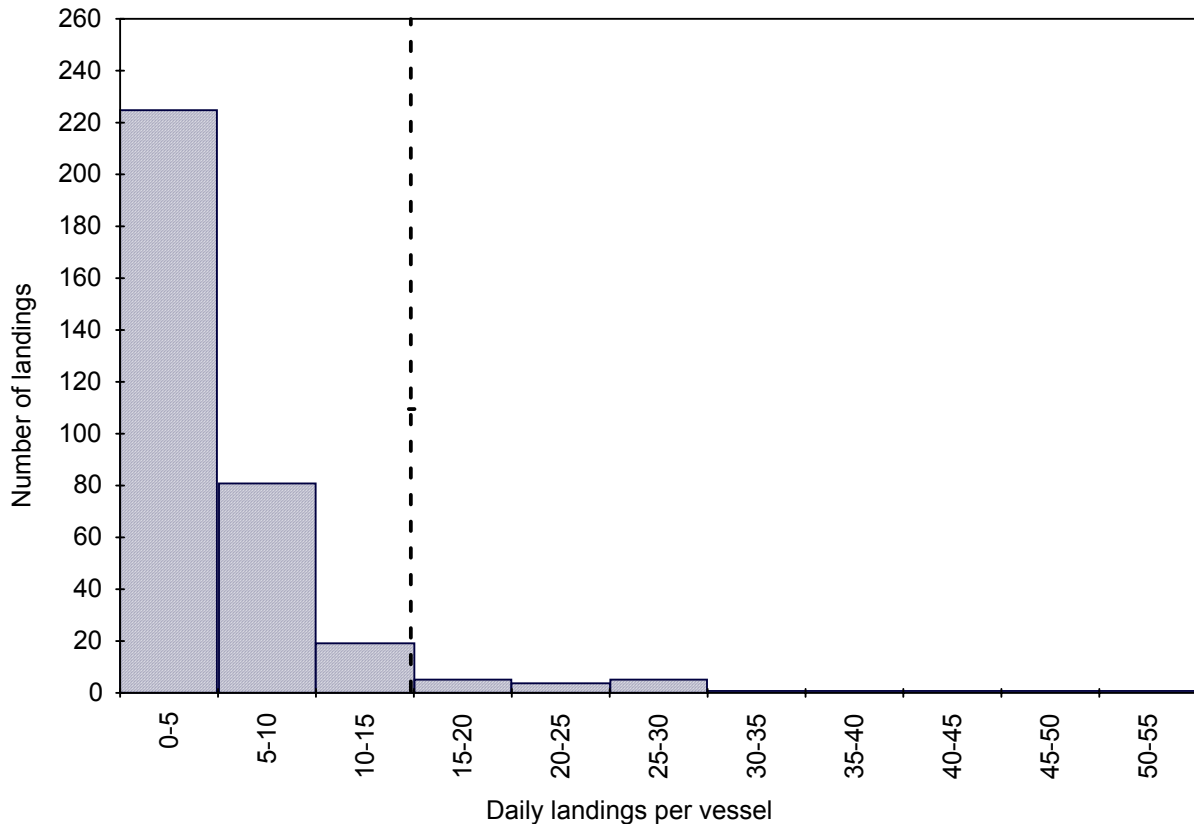


Figure 6-2. Daily market squid landings for currently permitted vessels using brail gear during the window period of January 1, 1990 through November 12, 1999.

A proposal to adopt a trip limit for roundhaul vessels between 60-90 short tons was presented to the Commission in 2001. After hearing public comments, the Commission voted not to adopt a daily trip limit as part of the interim regulations.

B. Options for Establishing a Daily Trip Limit

Option B.1 (Proposed action): Establish a daily trip limit between 60-90 tons daily for market squid vessels and 15 tons for brail vessels.

Option B.2: (Status quo): Do not establish daily trip limits for the market squid fishery.

6.1.3 Existing Weekend Closure

Background

Interim regulations (§149) prohibit the take of market squid for commercial purposes each week between noon Friday and noon Sunday from Point Conception south to the U.S.-Mexico border. The closure extends an existing

squid fishery closure for the same time period north from Point Conception to the California-Oregon border (FGC §8420.5). The regulations affect vessels catching squid and vessels using lights to attract squid, and do not apply to those pursuing squid for live-bait purposes. This precautionary measure was adopted to provide spawning squid at least two consecutive nights each week respite from fishing pressure.

C. Options for Weekend Closure

Option C.1 (Proposed action – status quo): Continue closures from noon Friday to noon Sunday from the U.S.-Mexico border to the California-Oregon border.

Option C.2: Do not continue weekend closures.

6.1.4 Research and Monitoring Program

6.1.4.1 Egg Escapement Monitoring of Fishery

Several international squid fisheries are managed by a process that allows a proportion of the population to escape in order to spawn to sustain the population for the following year. These escapement models require an accurate assessment of the population biomass and squid mortality, as well as a measure of fishing pressure. Population modeling work has not been successful in estimating the biomass of market squid. However, an escapement model, funded by the Department in cooperation with the NMFS, Southwest Fisheries Science Center, has been developed using “egg escapement.” Because market squid are harvested on their spawning grounds, it is critical that an adequate number of eggs are spawned prior to harvest. The egg escapement model (Section 4.2.2), which the PFMC has presented for public review under Amendment 10 of the CPS FMP, recommends that a threshold value of 0.3 (30%) be used initially, given: (1) a reproductive escapement threshold of roughly 0.4 (40%) has been used effectively in other squid fisheries (e.g., Falkland Islands fishery – keeping in mind that the Falkland Island fishery harvests primarily juveniles using trawl gear); (2) not all of the squid spawning grounds off the California coast are subject to fishing pressure; (3) an existing weekend closure allows two days per week for spawning to occur uninterrupted (de facto spawning escapement of 29%); and (4) the daily mortality of females during spawning is likely quite high. The egg escapement model is only valid as long as the fishery continues to harvest spawning adults; in the event that the fishery modifies its target to result in an increased fishing pressure on juveniles, this model would be invalid.

The egg escapement method of regulating the fishery relies on the Department to monitor the squid fishery at an appropriate level. The Department currently collects a maximum of 25 samples of 30 squid each month from the major ports that land squid. Collections include data on length, weight, and sex; female

gonads and muscle tissue samples; and statoliths for subsequent ageing of squid. The egg escapement model, as a proxy for MSY, is only a temporary measure until an acceptable biomass estimate can be determined for market squid. On the chance that a biomass estimate is never determined for market squid, agencies will continue to improve the egg escapement method by increasing sample sizes.

6.1.4.2 Sampling and Survey Program

In 1998, fishery managers, researchers, and statisticians from the Department and NMFS met to develop fishery-dependent and fishery-independent sampling and survey programs for market squid. During this meeting, goals were identified and a series of sampling protocols were developed to attain data necessary to expand existing knowledge of basic market squid biology, life history, and commercial fishing activity. Since 1998, market squid research undertaken by the Department has included: 1) collecting fishery and biological data through port sampling efforts, 2) conducting fishery-independent surveys to characterize spawning habitats, measure egg production, and attain indices of relative abundance, 3) developing information on age and growth of squid, and 4) collecting information on fishery effort through a logbook program and analysis of satellite data to track growth of the fishery. Additionally, biological work has been undertaken by contracted researchers to examine genetics, age, growth and fecundity of squid and evaluate early life history.

In May 2001, a Stock Assessment Review (STAR) panel was convened to:

- Review recent findings on the biology and life history of market squid, including the assessment-related aspects of age and growth, maturity, fecundity, spawning behavior, longevity, habitat, and environment;
- Review newly developed fisheries-related data, including catch history, effort data, and port sampling protocols as they relate to estimation of key biological and population parameters;
- Review all aspects of MSY estimation, as required by the MSFCMA for all FMPs, and address the concept of MSY as it relates to a species that is short-lived and whose abundance/availability is largely determined environmentally;
- Consider management measures for market squid, including operationally practical control rules, long-term monitoring programs, and in-season adjustment mechanisms;
- Prepare a report for the PFMC SSC detailing the findings of the review, practical management recommendations, and the key research and data needs.

The STAR panel reached a consensus that the market squid fishery in California needs to be monitored through the egg escapement model (section 6.1.4.1) and the Department's port sampling program should be continued while additional

research is being conducted on squid abundance and biomass. To acquire better information on squid taken in the California fishery, the Department developed and implemented a system to track seasonal variations in length, weight, sex, age, and maturity, and to accurately profile the state's commercial market squid fishery by tabulating catch data on a daily basis.

Relative to CPS finfish, the market squid is a poorly understood species; extensive biological data needed for assessment purposes are lacking. Recent age and growth information suggests that maximum age is less than one year, and the average age of squid taken in the fishery is approximately six to ten months.

Squid are more intensively harvested than long-lived animals. The fishery, however, is often subject to extreme fluctuations in availability due to El Niño events (when landings are minimal). Because the numbers of market squid harvested and found in the diets of marine species decline considerably during El Niño events, it may be assumed that squid abundance is negatively affected by El Niño events. If this is the case, it appears that the squid population seems to have the ability to recover fully in a relatively short period.

Present understanding of market squid population dynamics is inadequate. Annual fluctuations in the commercial catch may reflect squid abundance patterns rather than just local availability or market demand, but this idea has not been substantiated. Although some information exists on coastwide market squid distribution and abundance from fishery-independent midwater and bottom trawl surveys aimed at assessing other species, there is no good measure of annual recruitment success beyond information attained from the fishery. As fishing activity occurs only on shallow-water spawning aggregations, it is not clear whether reduced landings reflect only a decline in availability to the fishery or if overall stock size is diminished, since squid egg cases have been commonly documented at greater depths.

The best information available indicates that squid have a very high natural mortality rate (approaching 100% per year) and the adult population is composed almost entirely of new recruits. No spawner-recruit relationship has been demonstrated. This implies that the entire stock is replaced annually, even in the absence of fishing. Thus, the stock may be entirely dependent on successful spawning each year coupled with good survival of recruits to adulthood.

Historically, the squid resource was considered by some to be underutilized; recently (during El Niño periods) demand has sometimes exceeded the catch. Until vastly improved estimates of abundance are available, the true status of the population will remain unknown. Past work has included acoustic surveys and various collection techniques. Acoustical assessment of squid has been attempted off the central Oregon coast (Jefferts et al. 1987), and, with the Department's scientific research program initiated in 1998, efforts to model the

population continue. This may eventually give rise to thorough and detailed stock assessments similar to those undertaken for other squid stocks or coastal pelagic finfish species.

William Gilly at Hopkins Marine Laboratories continues research on market squid genetics, specifically looking for spatial differences in squid within California. Preliminary work indicates that there might be a slight genetic difference between squid harvested in northern vs. southern California, but to date has been inconclusive. Thus, the number of market squid stocks or subpopulations along the Pacific Coast is unknown at this time. It is hoped that modeling work, combined with fishery-independent surveys and information from scientific research, will allow for development of an effective management strategy for the resource in future years.

For a better understanding of squid population biology more complete information on the extent and distribution of spawning grounds along the Pacific coast is required, particularly in deep water and areas north of central California. Additionally, more data on fecundity, egg survival, and paralarvae production-per-unit-area estimates in different types of spawning habitats and water conditions are needed. Furthermore, information describing mechanisms and patterns of dispersal of adults and paralarvae along the coast (i.e., stock structure) is necessary to determine how local fishing and environmental impacts might be mitigated by recruitment from other areas.

6.1.4.3 Logbook Program

Following recommendations from the SFAC and SRSC, a logbook program designed to collect information on effort in the fishery was developed and implemented in late 1999. The program became mandatory in February 2000. Both light and roundhaul vessels provide information on their catch and effort during each day of fishing activity. Information on fishing effort for the California squid fishery may be a critical component of a method used to model the population. To date, standard population models have not been successful for market squid (see Appendix X). Information collected from roundhaul vessels includes set times, set locations, water temperature, net length, mesh size, and the role light boats made in the catch. The presence and absence of birds and mammals during fishing operations is also recorded. Recording observed bycatch by all gear types is required. Light boats are required to provide information on light wattage used, search time, searching equipment (i.e., sonar, echosound), and estimated tonnages of squid aggregated and caught by roundhaul vessels in each set.

Information on the identification of the vessels participating in the fishery, characterizing the use of gear to take squid, the number of vessels using each gear type, fishing and landing patterns and market value can be obtained from logbooks. Most vessels use roundhaul gear (i.e., purse seine, drum seine) to

catch squid, while a small fleet uses brail nets to scoop squid directly from the surface. As the program is newly established, no effort estimates have been generated from this source of information to date. Effort data from the logbook program have the potential to refine the egg escapement model that is based on F_{MSY} proxy.

D. Options for Research and Monitoring Program

Option D.1 (Proposed action – status quo): Monitor the fishery through the egg escapement model while pursuing a biomass estimate of market squid.

Option D.2 (Proposed action – status quo): Continue existing squid research and monitoring programs, especially programs aimed at the development of management models.

Option D.3 (Proposed action – status quo): Maintain logbooks for squid fishing vessels and squid light boats.

6.1.5 Area Closure for Squid Harvest Replenishment

Background

Harvest replenishment areas would limit effort geographically and possibly protect portions of market squid stock. Refugia have multiple uses, including providing a buffer for species against the effects of environmental fluctuations and management uncertainties, protecting specific areas or species from overexploitation, providing fisheries enhancement, and reducing user conflict. At the present time, commercial fishermen are not allowed to fish in state designated ecological reserves using roundhaul nets. Several existing reserves are known to be market squid spawning sites (e.g., Carmel Bay Ecological Reserve, Point Lobos Ecological Reserve, Pelican rookery area off the north side of East Anacapa Island, front side of Santa Catalina Island, Santa Monica Bay); all serve as harvest replenishment areas for market squid.

Reserve areas have been proposed for the northern Channel Islands. In 1998, the Channel Islands Marine Resources Restoration Committee, a group of concerned citizens, requested that the Commission establish a network of Marine Protected Areas around the northern Channel Islands. After more than two years of meetings, involving a broad based constituent group, the Department and the Channel Islands National Marine Sanctuary submitted a recommendation to the Commission for the northern Channel Islands MPAs, which could close known squid fishing grounds at Santa Barbara, Anacapa, Santa Cruz, and Santa Rosa islands.

In addition to the MPA process for the Channel Islands, the Marine Life Protection Act requires that the Department develop a plan for establishing a network of Marine Protected Areas in California waters. These MPAs will

supplement the current reserves in addition to any new areas protected at the Channel Islands.

E. Harvest Replenishment Area Options

Option E.1 (Proposed action – status quo): Do not set aside specific areas as harvest replenishment areas for market squid.

Option E.2: Close areas where squid spawning occurs that are not regularly employed by fishermen such as all waters within depths of 100 fathoms around San Nicholas Island.

6.1.6 Live Bait Fishery and Incidental Catch of Market Squid

Background

Market squid are an important source of live bait for the California recreational fishing industry. A small volume is also taken by the live bait industry using brail, lampara, or drum seine gear. This fishery is a high value use of squid, supplying bait to valuable recreational fisheries along the West Coast, primarily in southern California. Live bait catch is largely dependent on local availability, and is sold by vessels either at sea or at live bait dealerships in several harbors statewide. Since the sale of live bait in California is not documented in a manner similar to that used for the commercial sale of squid, estimates of tonnage and value are not available. Present market squid regulations do not require a squid permit when fishing for live bait. Commercial passenger fishing vessels pay 15% of their gross receipts to the dealers that furnish their live bait, which includes squid (P. Strasser, pers. comm.).

FGC § 8421(b) does not require vessels taking or landing market squid for commercial purposes to have a market squid permit if the incidental catch of market squid does not exceed two tons in any calendar day. A provision for incidental catch of market squid would permit fishermen to land a certain weight of squid that would otherwise be considered bycatch. Because squid frequently school with CPS finfish, mixed landings of market squid and CPS finfish are common. With a seasonal catch limitation in place, once the capacity goal is exceeded, an allowance for incidental catch of market squid from other commercial fisheries is imposed. This would prevent the squid being discarded as bycatch.

F. Options for Live Bait Fishery and Incidental Catch of Market Squid

Option F.1 (Proposed action – status quo): Continue existing regulations that do not require a squid permit when fishing for live bait. Continue existing regulations that do not require a market squid permit for vessels landing or taking market squid not to exceed two tons in a calendar day. Modify current live bait logs to include recording market squid taken as live bait.

Option F.2: Establish a permit for the taking of market squid as live bait.

6.2 Market Squid Socio-economic Concerns

6.2.1 Problem Statement

The state Legislature requires that fishery management plans examine economic and social factors related to the fishery. It is the policy of the Commission that restricted access programs be evaluated as a management tool in fishery management plans which will provide long-term social and economic benefits to the State and fishery participants. Management options that effect the socio-economic environment of the fishery have been designed to balance the need to provide a viable economic harvest with the need to protect the squid resource and are evaluated in Chapter 7.

6.2.2 Restricted Access - Limited Entry Program

6.2.2.1 Background

Prior to the 1998-1999 season, the squid fishery was an open access fishery. In 1996, new demand and markets for squid attracted many fishing vessels from other states. This influx of fishing vessels and increased competition has resulted in conflict and territorial disputes between "local" and out-of-state fishermen. Restricted access programs are primarily designed to address economic inefficiency associated with excess harvest capacity in open access fisheries. In a fishery such as the market squid commercial fishery, the main objective of a restricted access program would be to assure the greatest economic viability from the harvest of market squid.

Limiting the number of vessels may be one method of reducing take in order to protect the market squid resource. Even when fishery management specifies catch limits, season length, and gear allowed, fishermen still compete to catch as much as possible in the shortest period of time.

A restricted access program for the squid fishery should serve to balance the need to provide a viable economic harvest with the need to protect the squid resource. Access into the market squid fishery may be restricted by issuing only a certain number of licenses (limited entry). Limited entry should alleviate some overcapitalization of the squid fishing fleet. In the absence of a biomass estimate for market squid, a limited entry program, in conjunction with a seasonal harvest capacity, daily trip limits and weekend closures should prevent an overfished condition from occurring because it should provide spawning to occur throughout the season.

A restricted access program for the market squid fishery should be designed to match the level of effort to the sustainability of the resource and promote conservation among participants as well as maintain the long-term economic viability of the fishery. Three major components of a limited entry program are identified and recommendations provided on a fleet capacity goal, initial issuance criteria, and guidelines for permit transferability.

6.2.2.2 Summary of Commission Policy and Guidelines

California's fisheries are to be protected, conserved and managed for the public benefit, which may include food production, commerce and trade, subsistence, cultural values, recreational opportunities, maintenance of viable ecosystems, and scientific research. None of these purposes need be mutually exclusive and, ideally, as many of these purposes should be encouraged as possible, consistent with resource conservation.

If harvest and other human-caused factors affecting the sustainability of the squid fishery are not managed, fishery resources may be less than optimally productive or, in the worst case, may suffer serious declines. Therefore, as part of a program of controlling harvest, controlling fishing effort applied in a fishery is appropriate, including restrictions on the number of individuals or numbers of vessels participating. Restricting access to a fishery has become one of many standard fishery management tools used by public agencies in carrying out their conservation and management responsibilities for publicly held fishery resources. It is the policy of the Department and Commission to design restricted access programs to enhance the State's ability to manage its commercial fishery resources. Restricted access programs should: 1) contribute to sustainable fisheries management by providing a means to match the level of effort in a fishery to the health of the fishery resource and by giving fishery participants a greater stake in maintaining sustainability; 2) provide a mechanism for funding fishery management, research, monitoring, and law enforcement activities; 3) provide long-term social and economic benefits to the State and fishery participants; and 4) broaden opportunities for the commercial fishing industry to share management responsibility with the Department.

More specifically, the Commission's purposes for restricting access or entry to a fishery are described as: 1) promote sustainable fisheries; 2) provide for an orderly fishery; 3) promote conservation among fishery participants; and 4) maintain the long-term economic viability of fisheries. Restricted access programs may be instituted in order to carry out one or more of these purposes in a given fishery.

Promote Sustainable Fisheries. Depending on the fishery, limiting the fishing capacity of the fishery by limiting the number of individual fishermen or vessels may be one means of reducing take in order to protect the fishery resource. In most instances, reducing the number of individuals or vessels alone will not in

itself reduce take unless it is accompanied by complementary measures such as trip limits, quotas, seasons, or gear limitations. Together, restrictions on access coupled with other measures can be an effective way of controlling effort.

Provide for an Orderly Fishery. Extreme overcapitalization can lead to unsafe conditions as part of the competition among fishery participants, as in the case of "derby" fisheries. Properly designed restricted access programs can promote safety in those circumstances. Where fishing grounds are limited due either to geographical factors or fish congregating in small areas where harvest occurs, it may be necessary to limit the number of individuals or vessels involved in the fishery. The herring roe fishery is one example of where restricted access was established primarily for maintaining an orderly fishery.

Promote Conservation Among Fishery Participants. Limiting the number of individuals or vessels in a fishery can give those in the fishery a greater stake in the resource, a sense of ownership, and confidence that a long-term opportunity exists in the fishery that usually does not exist in open access fisheries. A well-designed restricted access program can give fishery participants greater incentive to be stewards of that resource and even to invest in rebuilding the fishery (the commercial salmon stamp program, for example). Limiting access can also increase compliance with fishery regulations since an individual with a restricted access permit is much less likely to risk losing the opportunity to participate in that fishery because of a fishery violation.

Maintain the Long-term Economic Viability of Fisheries. To assure the greatest economic benefit to society from the harvest of a public fishery resource, it may be necessary to limit the number of individuals or vessels to assure economically viable fishing operations. When open access contributes to the impoverishment of fishery participants or illegal or unsavory behavior by participants competing for the limited resource, some form of restricted access based on economic viability may be necessary. Any restricted access program established, entirely or in part, for the purpose of economic viability must be crafted to avoid restricting access more than is necessary.

Because a primary purpose of restricted access programs is to match the level of effort in a fishery to the health of the fishery resource, each restricted access program that is not based on individual transferable quotas shall identify a fishery capacity goal intended to promote resource sustainability and economic viability of the fishery. Fishery capacity goals can be expressed as some factor or combination of factors that fairly represents the fishing capacity of the fleet. These factors may include the number of permitted fishery participants, number of permitted boats, net tonnage of the permitted fleet, amount of gear used in the fishery, and cumulative hold capacity. Fishery capacity goals should be based on such biological and economic factors as what is known about the size and distribution of the target species, historic fleet size or harvest capacity, and distribution of harvest within the current fleet. Conflicts with other fisheries or

ocean interest groups and economic conditions (current and future) within the fishery may also be factored in to such determinations. Depending on the fishery, the fishery capacity goal may be expressed as a single number or as a range.

6.2.2.3 Rationale for Implementation

Vessels currently participating in the market squid fishery are capable of harvesting more squid than is available under current or likely future biomass conditions. Fisheries characterized by excess harvesting capacity are described as overcapitalized in terms of the number of vessels and the amount of gear and equipment devoted to harvesting. As fisheries become overcapitalized, harvesting costs increase while catches remain the same. This situation represents an economically inefficient use of society's productive resources, and causes several problems for managers and the fishing industry when abundance and demand decline, and catches are reduced. As harvesting capacity in fisheries increases, problems arising from the need for more restrictive management measures and resolution of allocation issues become more acute. No relief from these problems will occur if harvesting capacity continues to rise. Taking action to reduce excess capacity before a resource reaches depleted status is a proactive management strategy that may thwart or alleviate potential problems with resource allocation in the future.

Available information indicates that market squid vessels permitted in the 2000-2001 season could harvest in excess of 15,000 tons a day operating at maximum efficiency, an amount in excess of the volume of squid likely to be available under the most optimum of conditions. Additionally, many of the 195 current permit holders participate in the fishery at a minimal level (see Table 6-3). During the season with the highest volume of catch on record (1999-2000), 70 vessels accounted for 95 percent of the statewide catch landed by permitted vessels in the fishery. The remaining market squid vessels permitted that season represent a large capacity that is presently unutilized or underutilized.

6.2.2.4 Scope of Limited Entry

Vessels landing less than two short tons of squid on a per trip basis will not be required to possess a limited entry permit. Additionally, landing of squid beyond the jurisdiction of the state of California will not be affected by any limited entry requirements. Recreational fishing for squid will not require a limited entry permit, nor does fishing for squid for use as live bait.

6.2.2.5. Capacity Goal

6.2.2.5.1 Capacity Goal Background

A variety of fleet capacities can be computed using different assumptions about the number of days fished and the maximum productivity of each vessel described in section 3.2.2. Based on this analysis, several capacity goal options for the optimum number of market squid vessels are outlined below going from a highly productive and more specialized fleet which fishes squid more often, to a less productive and more diversified fleet. Fewer boats will result in the fleet becoming more specialized, and these vessels will presumably need to be more productive for squid, resulting in a fleet with minimal excess or latent capacity. More boats will result in a fleet that is diversified to fish in other fisheries as well as squid, and some vessels of the fleet may fish less often for squid and be less productive. As a result, there may be excess and latent capacity that remains unutilized, and the fleet could be considered overcapitalized.

The greatest number of days with landings by a single market squid vessel permit holder is 130 during the 1999-2000 season. Applying a maximum number of 130 fishing days implies vessels will be focused only on squid fishing activity at the expense of other fishing opportunities such as tuna or other coastal pelagic species. The highest average number of fishing days for current permit holders was 45 days in the 1981-1982 season, prior to implementation of a limited entry program. Likewise, applying the maximum catch a vessel may theoretically ever make serves to generate an estimate of the maximum possible productivity in the fleet, while applying information on an individual vessel's maximum catch may yield a more realistic approach of how the fleet may be expected to perform.

Based on a long-term ratio of one light boat per roundhaul vessel during fishing activities, it would follow that the light boat capacity goal option should be consistent with the vessel capacity goal. As light boats do not land the catch, it was virtually impossible to track light boat activity and vessel participation until implementation of the logbook program in 1999. During the 2000-2001 and 2001-2002 (preliminary) fishing seasons, logbook analysis shows that 73 different light boats were active. However, this data have not been analyzed for vessel performance so an assessment of the light boat fleet for capacity is not available at this time and capacity may not be applicable.

Optimum brail vessel capacity is difficult to evaluate since it is a small component of the fishery. There are currently 25 vessels with market squid permits that use brail gear to land squid, however, only 13 vessels have been active in the last three fishing seasons. Based on similar criteria used above for evaluating the vessel capacity goal options, 18 brail vessels operating at their maximum catch levels and an average number of days would catch an amount of squid equal to the highest brail catch on record.

G. Options for Market Squid Fleet Capacity Goal

Option G.1: Establish a capacity goal for market squid vessels that produces a highly productive and more specialized fleet. This option assumes that the maximum catch that would ever be possible for each boat is caught on every trip. If the vessel fished a maximum of 130 days per season, 10 vessels operating in this manner could land the maximum seasonal catch. This option would then set the capacity goal for light vessels at 10 light boats.

Option G.2 (Proposed action): Establish a capacity goal for market squid vessels that produces a moderately productive and specialized fleet. This option assumes that the maximum catch that each boat made is caught on every trip. If the vessel fished the highest average number of day per season (45), 52 vessels operating in this manner would land the maximum seasonal catch. This option would then set the capacity goal for light vessels at 52 light boats.

Option G.3: Establish a capacity goal for market squid vessels that produces a less productive and less specialized fleet. This option assumes that the average catch for each boat continues. If the vessel fished a maximum of 45 days per season, 104 vessels operating in this manner would land the maximum seasonal catch. This option would then set the capacity goal for light vessels at 104 light boats.

Option G.4 (Proposed action): Establish a capacity goal for brail vessels at 18 vessels.

Option G.5 (Status quo): Do not establish a capacity goal (no limited entry program)

6.2.2.6 Initial Issuance Criteria

6.2.2.6.1 Background

Establishing limited entry qualifying criteria is a first step in reducing fleet size from the 197 squid vessels and 50 light boats currently permitted to achieve the selected capacity goal, provided the current number of vessels is in excess of the selected goal. Each option below provides different permitting strategies and results in a different number of vessels anticipated to qualify. Information for each option described below was prepared using catch information from the Department's commercial landings database as well as information on squid permit holders provided by the Department's License and Revenue Branch. All analyses are based on preliminary records and data, and are subject to change with subsequent revisions of these data sets.

Five major permit categories have been identified in developing options for initial issuance criteria: (1) transferable market squid vessel permits, (2) non-transferable market squid vessel permits, (3) transferable brail permits, (4) non-transferable brail permits, and (5) market squid light boat permits.

FGC §8101 permits any licensed fisherman to participate during the initial year of a limited entry program regardless of the prescribed conditions for entry if the fisherman presents to the Department satisfactory evidence that he or she has been licensed as a California commercial fisherman for at least 20 years and has participated in the specific fishery. Further, the fisherman must demonstrate qualifying participation in the fishery through landings or other appropriate criteria determined by the Commission.

6.2.2.6.2 Recommended Permit Issuance Guidelines

- Each qualifying vessel will entitle the current owner to one limited entry permit.
- A vessel qualifies for a limited entry permit by meeting the initial issuance criteria.
- A given vessel cannot receive more than one limited entry permit.
- The vessel owner is responsible for maintaining the permit and any other documentation required on board each vessel with a permit to fish for squid.
- Limited entry permits will be registered for use with a vessel; the registered vessel may be changed only according to procedures outlined in regulation.
- A limited entry permit may not be used with a vessel unless it is registered for use with that vessel.
- Only entities (persons, corporations, etc.) qualified to own a U.S. fishing vessel may be issued or may hold a limited entry permit.
- Permits must be renewed annually by April 30 to avoid a late fee. If renewal does not occur by May 31, the permit is considered forfeited.
- A seasonal permit fee will be established which reflects the administrative costs of maintaining the limited entry program, as well as supporting fishery management, monitoring, research and enforcement.

6.2.2.6.3 Issuance of Initial Permits

SB 364 (Chaptered October, 1997) served as an initial notice of intent that a restricted access program was to be considered for the market squid fishery. This legislation established a squid fishery permit system; the system issued vessel-owner permits and permit renewal required possession of a permit the previous season (moratorium). This moratorium of squid permits further served to alert squid fishermen of the potential for a restrict access system. The SFAC proposed a Control Date of 12 November 1999 to the Department for consideration of historical landings for initial permit issuance. This date is more than two years after the legislation was enacted which served as notice of intent for a restricted access program.

The Commission's policy to determine qualification for an initial permit has three elements. First, the policy for all restricted access fisheries assumes that initiating a restricted access program will not increase the recent level of fishing effort. Second, initial issuance of permits will only be to the current owners of qualifying vessels. Third, in order to meet the needs of a particular fishery, it may be desirable to modify the approach of giving permits only to current owners of qualifying vessels.

California has had a practice of giving preference to vessels of fishermen with past participation when issuing restricted access permits. Among fishermen or vessels with past participation in the squid fishery, preference for permits may be based on factors such as years of participation in the fishery or level of participation (landings). Using landings as opposed to tonnage to qualify for initial issuance would be more equitable for the northern fishery.

Developing light boat initial issuance criteria is particularly problematic given that light boat participation is not documented via any formal method available to the Department, as the light boats are paid directly by the vessels to which they provide light. When the permit program was initiated, light boats could possess either a market squid vessel permit or a squid light boat owner's permit to use attracting lights. A number of currently active light boats hold market squid vessel permits rather than light boat permits based on the design of the permit structure during the 1998-2000 moratorium period. There could be as many as 164 vessels operating under either a light boat or market vessel permit. Beginning in 1999, the Department has operated a market squid logbook program. These records document light boat activity. Using submitted logbooks as documented participation in the squid fishery could effectively eliminate a majority of vessels.

Under FGC §8101, several vessels may qualify for market vessel permits based on the participant having possessed a California commercial fishing license for at least 20 years and have participated in the squid light boat fishery for at least one of those seasons. The Commission needs to determine what qualifies as participation. It is not required under this statute for the participant to have held a market vessel or light boat permit during the three-year moratorium period.

6.2.2.6.4 SFAC Recommendations for Initial Issuance

On 12 November 1999 the Squid Fishery Advisory Committee (SFAC) discussed limited entry at length and voted to recommend the following permit issuance criteria for participation in the fishery (Table 6-3):

- The participant must have possessed a valid permit to qualify.
- During the period of 01 January 1990 through 12 November 1999, market squid vessel permit holders must have made 50 landings.

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The SFAC further recommended that during the same period, 'brail vessels' must have made 10 landings for those vessels to attain a brail permit. The SFAC did not recommend qualifying criteria for light vessels. Since many currently active light vessels hold market squid vessel permits rather than light boat permits based on the design of the permit structure, the committee recommended that vessels that do not qualify for brail or vessel permits be provided the opportunity to purchase a market squid light boat permit the following year. This could result in the issuance of 156 light boat permits. The committee noted that they would like to establish limited entry criteria for the light boat fleet at some point in the future, but because there is no official proof of historic participation (since light vessels do not land squid, and therefore do not possess landing receipts) there was no adequate method by which to assess participation.

Table 6-3. Summary of SFAC recommended criteria for initial issuance of a limited entry permit.		
Permit Type	Initial Issuance Criteria	Anticipated Number of Qualifying Vessels
Market Squid Vessel Permit	Possession of a valid 2000/01 market squid permit; 50 market squid landings between January 1, 1990 and November 12, 1999	74
Market Squid Brail Permit	Possession of a valid 2000/01 market squid permit; 10 market squid landings brail landings between January 1, 1990 and November 12, 1999; landings may come from more than one vessel if they can be tied to a valid permitholder	15
Market Squid Light Boat	Possession of either a market squid vessel or light boat permit during the 2000/2001 permit year	156

H. Options for Initial Issuance of Market Squid Vessel Permits (Transferable)

Option H.1: Do not have a permit program (no limited entry).

Option H.2: Allow permit purchase by any permitholder who held a permit in the first year of the moratorium (239 vessels qualify).

Option H.3 (*Status quo*): Continue with existing moratorium program (195 vessels qualify).

Option H.4 (*Proposed action*): To qualify for a market squid vessel permit, all participants must hold a current market squid vessel permit and have made 50 landings during the window period (74 vessels qualify) OR participants must hold a current market squid vessel permit, have possessed a California commercial fishing license for at least 20 years, and have participated in the squid fishery for

at least one of those seasons, defined as having made 33 landings in one season (approximately 30 additional vessels qualify).

Option H.5: To qualify for a market squid vessel permit, all participants must hold a current market squid vessel permit, and have made 75 landings during the time period 01 January 1990 through 12 November 1999 (68 vessels qualify) OR participant must hold a current market squid vessel permit, have possessed a California commercial fishing license for at least 20 years and have participated in the squid fishery for at least one of those seasons, defined as having made 33 landings in one season (approximately 30 additional vessels qualify).

I. Options for Initial Issuance of Market Squid Vessel Permits (Non-transferable)

Option I.1 (*Proposed action*): The participant must have possessed a California commercial fishing license for at least 20 years and have participated in the squid fishery for at least one of those seasons, defined as having made 33 landings in one season (unknown number of qualifiers) to qualify for a market squid vessel permit.

Option I.2: Do not issue non-transferable market vessel permits.

J. Options for Initial Issuance of Market Squid Brail Permits (Transferable)

Option J.1: To qualify for a market squid brail permit, all participants must hold a current market squid vessel permit and have made 10 brail landings during the time period 01 January 1990 through 12 November 1999. Landings by one permit holder on a variety of vessels can be counted together as long as they can be tied to the permit holder (15 vessels qualify, eight of which also qualify for market vessel permit) OR participant must hold a current market squid vessel permit, have possessed a California commercial fishing license for at least 20 years, and have participated in the squid brail fishery for at least one of those seasons, defined as having made 10 brail landings in one season (approximately 12 additional vessels qualify).

Option J.2 (*Proposed action*): To qualify for a market squid brail permit, all participants must 1) hold a current market squid vessel permit AND 2) have made 10 brail landings during the time period 01 January 1990 through 12 November 1999. Landings are tied to the vessel, not the permit holder, and cannot be combined with landings from another vessel (15 vessels qualify, eight of which also qualify for market vessel permit) OR participants must hold a current market squid vessel permit, have possessed a California commercial fishing license for at least 20 years, and have participated in the squid brail fishery for at least one of those seasons, defined as having made 10 brail landings in one season (approximately 12 additional vessels qualify).

K. Options for Initial Issuance of Market Squid Brail Permits (Non-transferable)

Option K.1 (Proposed action): The participant must have possessed a California commercial fishing license for at least 20 years and have participated in the squid brail fishery for at least one of those seasons, defined as having made 10 brail landings in one season to qualify for a market squid brail permit. The participant need not hold a current market squid vessel permit (unknown number of qualifiers).

Option K.2: Do not issue non-transferable brail permits.

L. Options for Initial Issuance of Market Squid Light Boat Permits

Option L.1: Do not have a permit program (no limited entry).

Option L.2: Allow light boat permit purchase by any permit holder who held a permit in the first year of the moratorium (301 vessels qualify).

Option L.3 (Status quo): Allow all current light boat permittees to qualify for a squid light boat permit (44 vessels qualify).

Option L.4: The participant must possess either a current market squid light boat permit (44 vessels qualify) or a market squid vessel permit (114-121 vessels qualify) to qualify for a squid light boat permit.

Option L.5 (Proposed action): The participant must possess *either* a current market squid light boat permit or a market squid vessel permit and have submitted one light boat log by 31 December 2000 to qualify for a squid light boat permit (54 vessels qualify).

Option L.6 (Proposed action): The participant must have possessed a California commercial fishing license for at least 20 years and have participated in the squid light boat fishery for at least one of those seasons, defined as having 33 nights of participation in one season to qualify for a squid light boat permit. The participant need not hold a current market squid vessel permit (unknown number of qualifiers).

6.2.2.7 Transferability of permits

Background

Limited entry permits are affixed to the owner (or corporation) of record of the vessel which qualifies. If there are more permits in the fishery than are allowed based on the determination of a capacity goal, transferability provisions can help meet the capacity goal over time while preventing disruption to the fishery. In the moratorium established for the fishery since 1998, transferability was disallowed except in cases of the permitted vessel being lost, stolen, destroyed or suffering

a major mechanical breakdown. Following Commission guidelines as described in section 6.2.2.2, transferability of limited entry permits should be allowed provided the provisions result in attainment of the capacity goal.

Selecting an option for transferability will be contingent upon other determinations including a capacity goal and initial limited entry permit issuance criteria. The further away the initial number of permits are from the capacity goal, the more restrictive the provisions for transferability will need to be to achieve the capacity goal over time. As with initial issuance criteria, options presented here are intended to represent the scope of options available and are those that have been suggested by various constituent groups. Development of further options for transferability is entirely contingent upon selection of initial issuance criteria. Capacity goals, initial issuance criteria options and transferability provisions must be considered in unison, as they are dependent upon one another.

M. Market Squid Vessel Permit Transfer Options

Option M.1 (*Status quo*): Do not allow permit transfers except in cases of major mechanical breakdown or loss of the vessel – this option will allow for more rapid attrition of the fleet, however, it likely will not meet the practical needs of working vessels and can have implications for vessel safety.

Option M.2: Establish full transferability of market squid vessel permits – this option will provide flexibility to meet the needs of the fleet but will not help to achieve the capacity goal.

Option M.3 (*Proposed action*): Establish full transferability of market squid vessel permits based on comparable capacity (within 5%) – this option will not assist in achieving the capacity goal, although it will prevent increase in fleet capacity while allowing for new vessels to enter the fishery.

Option M.4 (*Proposed action*): Establish transferability of market squid vessel permits to a vessel of larger capacity under a '2 for 1' or '3 for 1' permit retirement – this option will allow vessel owners to increase their vessel capacity by transferring their permit to a replacement boat and surrendering one or two additional permits. This may help to achieve the capacity goal if the capacity of the vessel whose permit is being retired is greater than the additional capacity of the new vessel.

- 2 for 1 - Permit holders wishing to increase their current capacity more than 5 percent and less than 35 percent must acquire another market squid vessel permit and surrender it to the Department for retirement.
- 3 for 1 - Permit holders wishing to increase their current capacity in excess of 35 percent must acquire and surrender two market squid vessel permits to the Department for retirement.

N. Market Squid Brail Permit Transfer Options

Option N.1 (Proposed action): Establish full transferability of market squid brail permits – provided a 15-ton daily trip limit for these vessels is implemented, there is no specific reason to restrict transfer of brail permits as they are a minor component of the fleet and do not significantly contribute to the fleet capacity.

Option N.2: Establish full transferability of market squid brail permits based on comparable capacity (within 5 percent) – should no daily trip limit be adopted for brail boats, this would be a viable option. This helps to meet the needs of the fleet without significantly increasing capacity.

O. Market Squid Light Boat Permit Transfer Options

Option O.1: Establish full transferability of light boat permits – this would be allowed only if the initial number of permits issued is equal to or less than the capacity goal.

Option O.2 (Proposed action): Establish full transferability of light boat permits with a '2 for 1' permit retirement – this would help to meet the fleets' needs and help to achieve the light boat capacity goal.

Option O.3: Trade '4 for 1' light boat permits for a brail permit – a light boat may acquire and surrender 3 light boat permits in exchange for a brail permit. This option will decrease light boat capacity, but there would be a subsequent increase in brail capacity.

6.2.2.8 Transferability Fee Structure

Background

Limited entry guidelines call for the establishment of an appropriate fee to implement such a program, while also providing funds for monitoring and research of the fishery and resource. Baseline cost for existing Department programs that directly deal with market squid research, monitoring, enforcement, and license sales currently exceeds \$750,000 annually. Although some revenue is generated from taxes levied on squid landings (\$3.80 per ton), this source of funding is variable and dependent entirely on the success of the fishery from year to year.

At the present time, vessels with market squid permits pay a fee of \$250 to transfer their permits to another permitted vessel [FGC §8427(a)]. This fee does not provide funds for monitoring or research of the fishery and resource.

P. Transferability Fee Options

Option P.1 (*Proposed action*): Set the permit transfer fee at \$1,000

Option P.2 (*Status quo*): Continue the existing permit fee transfer of \$250.

6.3 Ecological Concerns

6.3.1 Problem Statement

The market squid fishery is part of a larger ecosystem that includes the effects of ecological interactions and of the project on nontarget species and habitat. Information on environmental factors is presented to ensure the consideration of this project affects on resources.

6.3.2 Gear Restrictions

6.3.2.1 Light Gear

Background

As part of its interim regulatory authority, the Commission adopted regulations requiring that lights be shielded and wattage be limited to 30,000 watts per vessel based on a potential interaction between lights used for squid fishing and nesting seabirds on offshore islands in southern California (see section 6.4). At the time the light restrictions were adopted, the Commission asked the Department to report as to effectiveness of the interim measures in a year. Although the Department has attempted to measure the effectiveness of these gear restrictions, a threshold value for light intensity that negatively impacts the breeding success of seabirds has not been determined.

Spawning squid do not appear to have standard sites that they target. It is not known what prompts squid to deposit their eggs at certain locations. Further, it is not known if squid exhibit site fidelity, returning to the same spawning site where they hatched. These factors, combined with environmental changes affect where the squid fishery operates at any given time. Some seasons, fishing is concentrated along the coastline while other times it is further offshore at islands.

The growth of the southern California fishery has coincided with complaints from coastal communities about the intensity of the squid vessel lights. Regulations served to reduce the total amount of light transmitted to coastal communities, specifically the cities of Monterey and Malibu. Since shielding and wattage restrictions were put in place (May 2000), Malibu City, the Channel Islands Coast Guard, the Malibu/Lost Hills Sheriff Department, and the City of Monterey have not received any complaints about squid light vessels. In January 2002, the Laguna Beach police received about 40 calls from residents wondering what was happening in the waters less than half a mile offshore where the squid fleet was centered. The residents were apprehensive about the high concentration of vessels after 11 September 2001, rather than criticizing the presence of squid

vessels. Although squid boats fish in this area almost every year, the large number of vessels was unusual.

Q. Options for Gear Restrictions

Option Q.1: (Proposed action and status quo): Maintain existing gear restrictions which states that each vessel fishing for squid and lighting for squid will utilize a total of no more than 30,000 watts of light to attract squid at any time and that each vessel fishing for squid or lighting for squid will reduce the light scatter of its fishing operations by shielding the entire filament of each light used to attract squid and orient the illumination directly downward, or provide for the illumination to be completely below the surface of the water.

Option Q.2: Remove existing gear options regarding shields and wattage.

6.3.2.2 Other Gear

The SFAC, the SRSC, the Department, and the environmental community have expressed interest in exploring and developing other gear restrictions to minimize or mitigate interaction with the environment during squid fishing activity. Potential issues in this regard are preventing or minimizing the scraping of squid egg cases off the bottom by purse seine gear by modifying the length or construction of nets, or by establishing a minimum depth that fishing activity may take place. Disturbance of egg cases and spawning would create a bias not currently accounted for in the management of the squid through the egg escapement method. The egg escapement method assumes that egg cases deposited are subject to natural mortality not including mortality from fishing activities.

Other gear to be investigated for use in the squid fishery would be underwater lights to reduce light pollution from the squid fleet. Changes to gear type other than the current lighting regulations (wattage and shielding restrictions) are not being considered as a management option at this time but are addressed in section 8.3 (future data needs).

6.3.3 Seabird Rookeries

6.3.3.1 Background

In the summer of 1999, seabird researchers, the American Trader Trustee Council, and the Channel Islands National Park Service became concerned about potential effects on nesting seabirds on islands used by the squid fishery. Specifically, their concerns centered on disturbance to the island breeding colonies from high wattage lights and noise from market squid fishing vessels and they requested that the Department take action to prevent potential new impacts on the nesting birds.

Three species were the focus of the squid fishery interaction with seabirds: the brown pelican, Xantus's murrelet, and the ashly storm-petrel. Brown pelicans are federally and State-listed as an endangered as well as fully protected species. The other two seabirds are classified by the Department and the U.S. Fish and Wildlife Service as Species of Special Concern. Additionally, a petition to federally and state list the Xantus's murrelet is underway, citing the expansion of the commercial squid fishery as part of the rationale for listing.

Seabirds nest at the Channel Islands to avoid mammalian predators. Some smaller island nesting birds come and go to their burrows at night to further avoid predation. The typical seabird nesting period for the islands is during the spring and summer months (brown pelicans: March through August; all three species: February through October). Squid landings data for 1999 indicated that squid fishing in southern California, specifically the Channel Islands, coincided with the breeding season. This is different from the historic squid fishing season in southern California which occurs primarily during the fall and winter.

In 1999, post El Niño (La Niña) conditions were in effect. Because brown pelican productivity in Baja California had been good in the spring of 1999, the decline in their productivity on Anacapa Island was lower than anticipated. Many dead adult Xantus's murrelets were found on Santa Barbara Island. These observations coincided with intense squid fishing pressure near both of these islands. This level of fishing pressure had never been documented in the spring with such intensity as in 1999. Satellite imagery further verified the heavy fishing pressure and bright lights in 1999 near the nesting islands.

Three areas that provide habitat for the majority of the nesting seabirds in southern California are Santa Barbara, Anacapa, and San Miguel islands. Although only 6% of the California brown pelican population breed in the Southern California Bight, these three areas are the sole nesting colonies in the United States (Gress and Anderson 1983). Approximately 80% and 50% of Xantus's murrelet and ashly storm-petrel breeding populations in the United States, respectively, nest at these same islands.

6.3.3.2 Brown Pelican Productivity

According to Dr. Franklin Gress (UC Davis), brown pelican nest abandonment at Anacapa Island in 1999 coincided "precisely with a potentially very disruptive disturbance factor [in the form of the squid fishery] close to the breeding colonies." A table of the brown pelican productivity is provided in Appendix X. In 1999, the squid fishery used extremely bright lights extended for periods up to 12 hours (6:00 p.m. to 6:00 a.m.). Recently, the Department has had access to satellite data provided by the National Geophysical Data Center. These data allowed tracking of light presence or absence at various sites in southern California during 1999. Relatively high light levels (proportion positive, Table 6-6)

are evident in the area of Santa Barbara Island in April, May, and June 1999 and at Anacapa Island during the months of January through April 1999. Although a causal relationship has not been established between lights in the southern California squid fishery and reproductive success of brown pelicans, disorientation, increased predation, and nest abandonment are well documented in some bird species exposed to excessive light during nighttime hours. The proximity of the vessels involved in the squid fishery may have played a factor in the lower productivity and nest abandonment. It is documented that brown pelicans require a nesting ground that is free from human disturbance. In fact, this was the rationale behind the closure at Anacapa Island Ecological Reserve established in 1979 by the Commission (Title 14 630 Subsection 5C.1E). This closed area, offshore from a pelican colony site on West Anacapa, was designated as a reserve to prevent human disturbance to nesting brown pelicans and their chicks. It is closed seaward to 20 fathoms to both commercial and recreational craft from January through October.

Table 6-6. Illumination in sensitive areas determined by satellite observation. N denotes the number of nights satellite images were obtained and positive numbers were determined by light pixels in the sensitive areas.				
Month	<i>n</i>	Anacapa	Santa Barbara	San Miguel
January 1999	18	2	0	0
February 1999	20	2	0	0
March 1999	26	2	2	0
April 1999	22	7	7	0
May 1999	30	0	10	0
June 1999	26	0	4	0
January 2000	30	1	3	0
February 2000	29	5	1	0
March 2000	21	0	0	0

According to Dr. Gress's data, nest abandonment in 1999 was 47% (Table 6-7), 11% lower than the 1976-98 mean. The young-fledged-per-successful-nest-rate (excluding nest abandonment) was 1.08, 19% lower than the 1976-98 mean. At Anacapa Island, the rate is usually 1.3 to 1.5 chicks per nest. Food shortages at critical times are believed to be the primary cause for nest abandonment and chick mortality, which results in low productivity. However, during 1999, cold water La Niña conditions were in effect, which makes poor food availability an unlikely cause. Further, pelican productivity in Baja California was approximately double the value at the Channel Island for the same year. The difference in productivity between the two areas is considerable and there is no biological explanation known that can account for it.

Preliminary data for the 2000 and 2001 breeding seasons indicate that productivity was 0.90 and 0.80, respectively (F. Gress, pers. comm.) on West Anacapa Island.

Table 6-7. Chick mortality and nest abandonment data for brown Pelicans nesting at Anacapa Island (Gress, pers. comm.).					
	1997	1998	1999	2000	2001
Chick mortality	49%	4%	35%	6%	17%
Nest abandonment	55%	40%	47%	33%	40%

6.3.3.3 Department Light Study

Because of the intimation that lights from the squid fishery interfere with the nesting success of the California brown pelican, the Squid Fishery Advisory Committee (SFAC) recommended shielding lights and reducing wattage to a maximum of 30,000 watts to mitigate possible effects.

Shielding lights should block light that is emitted upward or in a horizontal direction from the bulb. The Department evaluated the light emitted from a shielded squid fishing vessel with the emissions from an unshielded vessel. Multiple light measurements were taken from four different distances for the shielded and unshielded fishing vessels and were repeated at different elevations [sea level, 150 ft above sea level (ASL), and 300 ft ASL]. The results indicate that shielded lights emit less light at approximately one-half mile offshore as compared with an unshielded vessel one-mile from shore for elevation up to 300 ft ASL (Fig. 6-3).

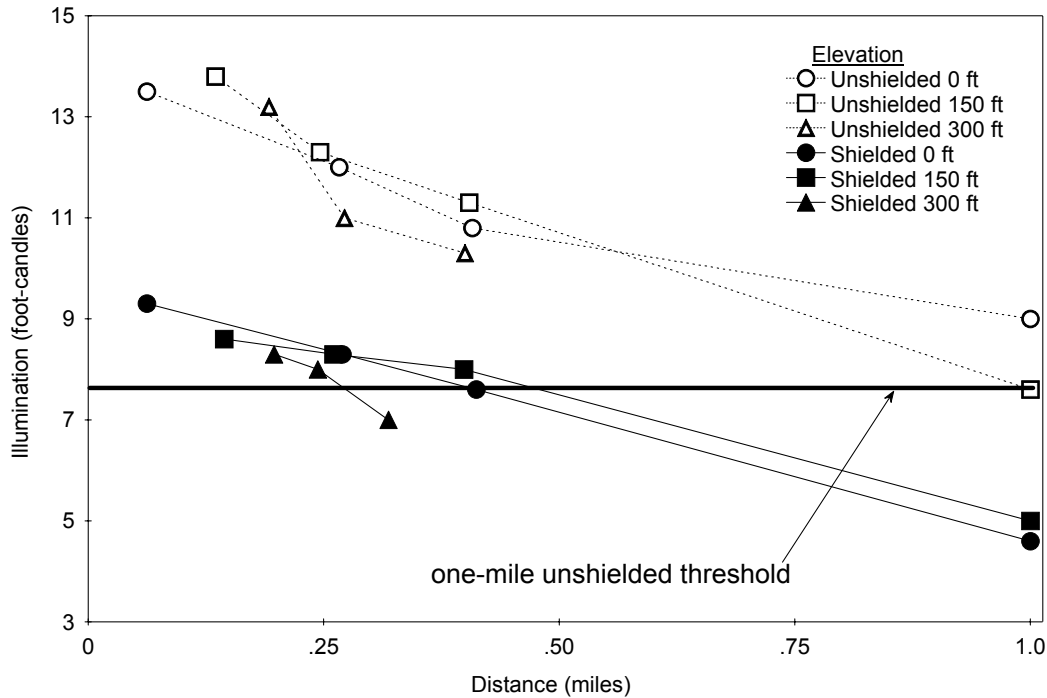


Figure 6-3. Results of at-sea light study showing the illumination differences for shielded and unshielded vessels using 30,000 watts at different distances from shore.

6.3.3.4 Results

Available data suggest a causal link between the lighting activity of the squid fishing fleet and pelican nesting disruption as well as adult mortality of Xantus's murrelets (B. Sydeman, pers. comm.). The Department and federal agencies, concerned about the brown Pelican population recovery and population levels of the Xantus's murrelet and ashy storm-petrel, were interested in avoiding any potential new interactions with these birds. To avoid risks to nesting brown pelicans and interactions with other seabird species of concern, the Department recommended and the Commission adopted a maximum allowable light wattage and specific requirements for orientation and shielding of lights for vessels fishing or lighting for squid. The management measures are: 1) entail the reduction of wattage from any individual vessel to 30,000 kilowatts, and 2) require the use of shielding for all vessels commercially fishing or landing squid. These interim regulations went into effect 30 May 2000.

In addition to conducting the at-sea lighting experiment to support the recommendation, the Department examined food availability data, pelican nest abandonment figures, pelican productivity numbers, and squid fishery fleet activities.

R. Options for Area and Time Closures to Address Seabird Issue

Option R.1: Establish areas that are closed to squid fishing around San Miguel, Anacapa and Santa Barbara islands from February through October. The area closure should be one nautical mile from the high water mark for these islands. The closure would protect fourteen seabird species (including one endangered and six species of special concern) during their breeding seasons.

Option R.2: Establish areas that are closed to squid fishing around Anacapa and Santa Barbara islands from March through August. The area closure should be one nautical mile from the high water mark for these islands. This closure should protect brown pelicans, as well as other seabird species, during the height of their breeding season.

Option R.3: Establish areas that are closed to squid fishing using attracting lights around San Miguel, Anacapa and Santa Barbara islands from February through October. The area closure should be one nautical mile from the high water mark for these islands. The closure should offset the potential negative impacts of light pollution at seabird rookeries.

Option R.4: Establish area and time closure areas for fishing for squid using lights around Anacapa and Santa Barbara islands from March through August. The area closure should be one nautical mile from the high water mark for these islands. This area and time closure should offset the potential negative impacts of light pollution from squid fishing and lighting vessels for protection of brown Pelicans, as well as other seabird species, during the height of their breeding season.

Option R.5 (*Status quo*): Maintain already established wattage and shielding regulations (refer to Option Q.1).

6.4 Other Actions

6.4.1 Advisory Committee for Squid Fishery

Background

In 1997, as part of Senate Bill 364 (Sher), a Squid Fishery Advisory Committee, made up of resource stakeholders, and a Squid Research Scientific Committee, consisting of many of the world's leading squid fishery scientists, were established and utilized to advise the Director on recommendations for squid conservation and management and to provide input on the development of research protocols. These two committees, although separate, have functioned well in making recommendations to the director, especially with regard to the Status of the Market Squid Fishery with Recommendations for a Conservation and Management Plan report to the Legislature and this FMP.

Maintaining an advisory committee for market squid could assist the Department with evaluating an FMP when implemented. Commission guidelines require the

periodic reexamination of established limited entry programs to determine if the program still meets the needs and objectives of the fleet and the State. Following adoption, the program must be reviewed at least once every four years at a regularly scheduled Commission meeting. The advisory committee would be responsible for reviewing the limited entry program and other management measures implemented for the fishery as well as to evaluate the status of the resource. Further, this committee would be responsible for preparing a report to the Department on the effectiveness of the current management plan.

S. Advisory Committee Options

Option S.1 (*Proposed action*): Establish one advisory committee for the squid fishery, which includes scientific, environmental and industry representatives.

Option S.2 (*Status quo*): Maintain the two committee system: one from the scientific community and one from industry.

Option S.3: Do not establish an advisory committee for the squid fishery.

6.4.2 Permit Fees

Background

Originally, Senate Bill 364 (Sher 1997) created an annual permit fee of \$2500 for the squid fishery for three years (beginning with the 1998-1999 season). Senate Bill 1544 (Sher) reduced permits to \$400 beginning with the 2001-2002 season. At the time, Governor Davis signed the second legislation, he requested that the fishery stakeholders and their representatives review the appropriateness of the reduced fee.

Limited entry guidelines require an appropriate fee to implement a limited entry program, while also providing funds for monitoring and research of the fishery and resource. The current baseline costs for maintaining existing Department programs that deal directly with market squid research, monitoring, enforcement, and license sales exceeds \$750,000 annually.

Although some revenue is generated from taxes levied on squid landings (\$3.80 per ton), this source of funding is variable and dependent entirely on the success of the fishery year-to-year. Any established permit fee needs to be reevaluated periodically.

T. Permit Fee Options

Option T.1 (*Proposed action*): Establish an annual permit fee of \$2500 for the squid fishery for fishing vessels, brail vessels and light boats.

Option T.2 (*Status quo*): Maintain existing annual permit fee (\$400).